REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

The specification has been amended to place the subject application in better form. A new abstract has also been presented in accordance with preferred practice. No new matter has been added by these changes.

Claims 37-60 are presented for consideration in lieu of claims 1-36, which have been canceled without prejudice or disclaimer. Claims 37 and 49 are independent. Claims 37-60 have been added to recite additional features of the subject invention. Support for these claims can be found in the original application, as filed. Therefore, no new matter has been added.

Applicant requests favorable reconsideration and withdrawal of the rejection set forth in the above-noted Office Action.

Cancelled Claims 1-8, 10-15, 35 and 36 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 4,860,374 (Murakami et al.) in view of U.S. Patent 5,136,661 (Kobayasi et al.). With regard to newly added Claims 37-60, this rejection is respectfully traversed.

Newly added independent Claim 37 is directed to position detecting apparatus that detects the position of a mark on an object. In the apparatus, a camera captures an image of the mark. An extraction section extracts plural edge positions of the mark based on a signal derived from the image of the mark. Each edge position is associated with combination of the direction and the polarity of the signal. A determination section determines the position of the mark by

19

comparing each of the plural extracted edge positions with a corresponding one of templates prepared for the respective combinations.

Newly added independent Claim 49 is directed to a method of detecting the position of a mark on an object. According to the method, an image of the mark is captured using a camera. Plural edge positions of the mark are extracted from a signal derived from the image of the mark. Each edge position is associated with the combination of the direction and the polarity of the mark. The position of the mark is determined by comparing each of the plural edge positions with a corresponding one of templates prepared for the respective combinations.

In Applicant's view, Murakami et al. discloses apparatus that detects a position of a reference pattern or mark formed in a substrate to be aligned with a photo-mask pattern. The apparatus scans a reference pattern having at least two edges and generates a time-serial pattern signal corresponding to the scanned pattern; extracts all scanning positions at which a waveform of the pattern signal has a shape corresponding to an edge of the pattern within a predetermined scanning range including the pattern; selects one pair from all possible pairs of a plurality of extracted scanning positions in accordance with a degree to which a pattern signal between the two scanning positions defined by each pair satisfies predetermined waveform conditions; and determines as a pattern position a predetermined position at which the interval between the two scanning positions of the selected pair is divided into two intervals by a predetermined ratio.

In Applicant's opinion, Kobayasi et al. discloses a position recognizing method and an apparatus in which an edge is detected by scanning a one-dimensional model. An edge to be recognized and one-dimensional edge detecting data of an image is obtained via a camera so as to

20

determine the difference between the density of the pixel of the one-dimensional model and the density of the corresponding pixel of the one-dimensional edge detecting data and the geometric balance therebetween. Then, the amount of data for detecting the edge becomes smaller and the pattern or parts can be recognized without controlling the binary level and at a high speed.

According to the invention defined in Claims 37 and 49, an extraction arrangement extracts plural edge positions of a mark based on a signal derived from the image of the mark. Each edge position is associated with a combination of the direction and the polarity of the mark image derived signal. Each of the plural extracted edge positions is compared with a corresponding one of templates prepared for the respective signal combinations.

The extraction of the edge positions is disclosed from line 26 of page 19 to line 12 of page 21 with respect to Figs. 3 and 4A-4E. The determination of the mark position is disclosed from line 5 of page 22 to line 25 of page 23 with respect to Figs. 4A-4E and 5A-5E. No new matter is believed to have been added.

Murakami may teach detection of the position of a mark formed on a substrate in which pairs of scanning positions are extracted from an image signal V by a first extractor and the differential signal V' by a second extractor. The extracted information of pairs of scanning positions, however, is completely distinct from and fails in any manner to relate to the feature of Claims 37 and 49 of extracting plural edge positions of a mark from a signal derived from the mark image wherein each edge position is associated with a combination of the direction and the polarity of the mark image derived signal. Further, it is not seen that Murakami et al. in any way teaches or suggests the feature of Claims 37 and 49 of determining the position of the mark by

comparing each of the plural edge positions with a corresponding one of templates prepared for the respective combinations.

Kobayashi et al. may teach with respect to Fig. 5 that a partial two-dimensional pattern from a binary image is compared with a stored target template to detect the position of a representative template as being closest to the target template and also discloses a one-dimensional edge detection arrangement in which the difference between the density of a pixel of a one-dimensional model and the density of the corresponding pixel of one-dimensional edge detection data is determined. The Kobayashi et al. disclosure, however, is devoid of any suggestion of the feature of Claims 37 and 49 of extracting plural edge positions of a mark from a mark image derived signal wherein each of the edge positions is associated with a combination of the direction and the polarity of the mark image derived signal.

With regard to the cited combination, it is not seen that Murakami et al.'s detection of the position of a mark formed on a substrate using pairs of scanning positions extracted from an image signal V by a first extractor and pairs of scanning positions extracted from the differential signal V' by a second extractor in any manner suggests the feature of Claims 37 and 49 of extracting plural edge positions of a mark from a signal derived from the mark image wherein each edge position is associated with a combination of the direction and the polarity of the mark image derived signal. It is further not seen that the addition of Kobayasi et al.'s comparison of a partial two-dimensional pattern from a binary image with a stored target template to detect the position of a representative template to Murakami et al.'s extracted scanning position pair type mark position detection could possibly suggest the features of Claims 37 and 49 of extracting

plural edge positions of a mark associated with a combination of the direction and the polarity of a signal derived from the image of the mark and determining the position of the mark by comparing each of the plural edge positions with a corresponding one of templates prepared for the respective combinations of signal direction and polarity. Accordingly, it is believed that newly added Claims 37 and 49 are completely distinguished from any combination of Murakami et al. and Kobayasi et al. and are allowable.
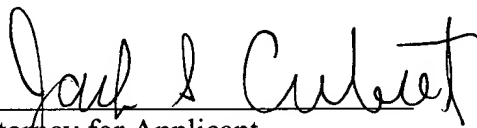
For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 37 and 49, also is patentably defined over the cited art, whether that art is taken individually or in combination.

Dependent claims 38-48 and 50-60 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable consideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,

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